

## Chapter 2: Alternatives

### 2.1 INTRODUCTION

For an environmental assessment or EA, the Federal Highway Administration (FHWA) Technical Advisory T6640.8A requires a discussion of at least two alternatives, a no-build and one or more build alternatives. This chapter presents the alternative development process, the conceptual alternatives considered but eliminated from further consideration, and a description of the alternatives selected for detailed evaluation.

### 2.2 PROPOSED ACTION

The purpose of the State Route (SR) 92, Lehi to Highland, project is to do the following:

- Alleviate congestion and improve traffic flow to meet the 2030 projected travel demand
- Provide a transportation facility that improves travel times to and from I-15 through the year 2030

In response to these purposes, the proposed action would increase capacity on SR-92, alleviating congestion and improving traffic operations through the year 2030. To expedite movement to and from I-15, intersection modifications are also proposed.

### 2.3 INDEPENDENT UTILITY AND LOGICAL TERMINI

Federal law requires any transportation project evaluated under the National Environmental Policy Act (NEPA) to have independent utility and logical termini. This law reads as follows:

Connect logical termini and be of sufficient length to address environmental matters on a broad scope ... have independent utility or independent significance, i.e., be usable and be a reasonable expenditure even if no additional transportation improvements in the area are made ...[and] not restrict consideration of alternatives for other reasonably foreseeable transportation improvements (23 CFR 771.111[f]).

#### **Western Terminus (I-15)**

In northeastern Utah County, traffic volumes on SR-92 increase from east to west, indicating that this corridor is the primary east-west arterial connector for vehicles accessing I-15. *The I-15 Corridor, Utah County to Salt Lake County Environmental Impact Statement* (EIS) is currently evaluating I-15, including the interchange at SR-92. For this reason, the east end of the I-15 interchange was selected as the western logical terminus. Coordination between this EA and the *I-15 Corridor EIS* is ongoing.

#### **Eastern Terminus (SR-146)**

SR-146, which is the eastern most north-south road serving the growing communities of Cedar Hills and Pleasant Grove, has experienced an increase in traffic volumes in recent years. The importance of the connectivity between SR-146 and SR-92 will continue to increase with growing traffic volumes. UDOT has been considering the reconstruction of this intersection to better

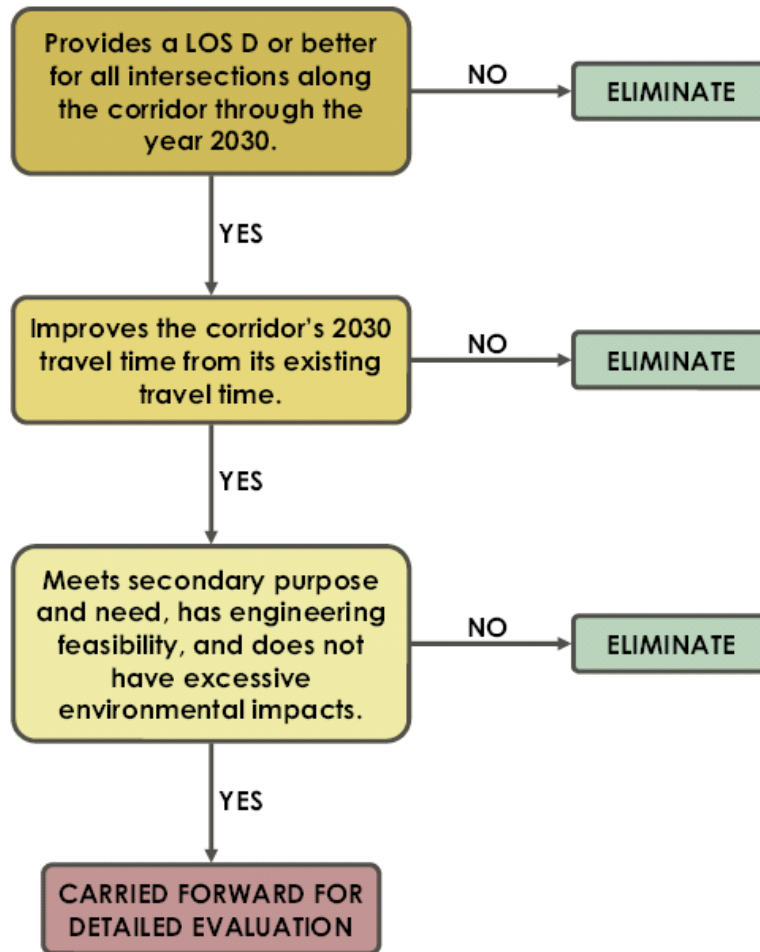
accommodate the predominant movement between SR-92 and SR-146, which serves more than 95 percent of this intersection's traffic. Immediately east of SR-146, SR-92 enters the American Fork Canyon and becomes a two-lane canyon road that serves as a scenic alternative connection to US 189, referred to as the Alpine Loop. However, this connection is seasonal; SR-92 in American Fork Canyon is closed in the winter. There are no planned future developments on SR-92 east of SR-146 because development is restricted by national forest designation. Therefore, there is not a considerable increase in 2030 projected traffic. For these reasons, the intersection with SR-146 was selected as the eastern logical terminus.

## **2.4 ALTERNATIVE SCREENING AND DEVELOPMENT PROCESS**

The first step in the alternative development process was to identify needs. As discussed in Chapter 1, previous plans and studies, existing conditions and traffic analyses, and input from stakeholders and the public helped provide insight into what the corridor's needs were. Conceptual alternatives were developed and screened against the project's primary purpose and need objectives. Secondary purpose and need objectives, engineering feasibility issues, and environmental constraints were also considered during alternative development. Although none of the alternatives were eliminated based on these three considerations, each played an important role in refining the alternatives.

If an alternative could not provide a level of service (LOS) D or better for the 2030 projected travel demand at all intersections along the corridor or could not improve travel times to and from I-15 through the year 2030, the alternative was either eliminated or modified to meet these primary objectives. If the alternative could effectively meet both of these criteria, it was carried forward for detailed evaluation. Figure 2-1 outlines the alternative screening process.

Figure 2-1: Alternative Screening Process



### **Measures of Effectiveness**

As discussed in Section 1.6, specific objectives and measures of effectiveness were developed to gauge how well an alternative meets the project's primary purpose and need. The measures of effectiveness, as listed below, are related to traffic operations. These can also be found in Table 1-6.

- Congestion and Traffic Flow. Based on evening peak-hour traffic, provide a LOS D or better for the intersections along the corridor through the year 2030.
- Travel Time. Improve the corridor's 2030 travel time from its existing travel time; currently the travel time between I-15 and SR-146 is 13 minutes traveling westbound and 19 minutes traveling eastbound during evening peak-hour conditions.

These measures of effectiveness dictate the number of lanes and intersection configurations required. A traffic analysis was conducted to determine the roadway improvements along the corridor that are necessary to provide a LOS D or better for each intersection's 2030 peak-hour conditions. The LOS for signalized intersections is predicted using the weighted average delay for all approaches to an intersection. A weighted average delay is based on the number of vehicles approaching the intersection from each direction and the delay imposed to these vehicles

during the peak hour. This measure gauges how well the corridor is serving both through traffic and traffic accessing the corridor from side streets.

The challenge with intersection LOS is that it does not fully account for mobility along the corridor. For example, a corridor could have ten intersections that all operate at a LOS D or better but provide a slower travel time than the traveling public demands. As traffic volumes increase and intersections reach a LOS D or E, coordinating signals for optimum traffic flow becomes difficult because motorists begin to wait multiple cycles to pass through an intersection. As a result, travel times can increase dramatically.

For alternatives that met a LOS D at all intersections, an additional traffic analysis was conducted to determine the travel time along the corridor. This analysis was also conducted for one alternative that met a LOS D at all but one intersection—the arterial alternative with at-grade intersections. Travel times were calculated using the evening peak-hour traffic volumes. Sensitivity analyses for the morning peak hour were also performed at critical sections of the corridor. It was determined that the morning and evening peak-hour traffic volumes were similar. The noteworthy difference between the two was the direction of the major traffic movement. Because both would be addressed through similar approaches, this EA will only discuss the evening peak-hour traffic to represent both morning and evening peaks; the evening peak-hour traffic will be used to signify the most congested time of the day for the corridor.

An alternative's projected travel time is compared to the corridor's existing travel time to measure the alternative's effectiveness; the alternative must improve travel time along the corridor through the year 2030. Currently, it takes 19 minutes to travel from the I-15 frontage road to SR-146 and 13 minutes to travel from SR-146 to the I-15 frontage road.

### **Engineering Feasibility and Environmental Constraints**

Alternatives have to be feasible from an engineering standpoint and have to meet design criteria. Design criteria are generally developed using two sources: American Association of State Highway and Transportation Officials' (AASHTO's) *A Policy on Geometric Design of Highways and Streets* and UDOT standards. Design criteria include elements like design speed, lane and shoulder widths, minimum horizontal and vertical curve radii, side slopes, and sight distance. For this project, Lehi's and Highland's design standards were also considered. Designs were based on a speed of 55 miles per hour (mph) through Lehi and 40 mph through Highland. The main factors that influenced alternative development were the location of water transmission facilities, terrain, traffic movement, side-street spacing, context, and the level of impacts an alternative would have on the surrounding environment.

The western half of the corridor is bounded by the Jordan Aqueduct on the north and the Provo Reservoir Canal on the south. These water transmission facilities are owned by the Bureau of Reclamation and deliver water to Salt Lake and Utah Counties for municipal, industrial, domestic, and irrigation uses. Reclamation is in the process of transferring the title for the Provo Reservoir Canal over to the Provo River Water Users Association (PRWUA). When this happens, a facility easement will be reserved for the Metropolitan Water District of Salt Lake and Sandy (MWDSL), the Jordan Valley Water Conservancy District (JVWCD), and the Central Utah Water Conservancy District (CUWCD). Providing an alignment and design that does not interfere with the operation and maintenance of Reclamation facilities influenced alternative development.

The area between I-15 and Center Street is an example of how the surrounding terrain influenced alternative development for SR-92. Because this area slopes steeply toward the southwest, widening SR-92 would be more difficult than in a flat area. Widening the corridor to the north would require cutting into the uphill slope and could impact the cover over the Jordan Aqueduct, while widening the corridor to the south would require placing fill or constructing walls on the downhill side of SR-92. Widening would also impact the vertical alignment of the cross streets. The terrain was taken into consideration during alternative development, and the design was influenced accordingly in an effort to minimize these impacts.

Traffic movement, like that at the intersection of SR-92 and SR-146, also influenced alternative development. Commuters transitioning between SR-92 and SR-146 make up more than 95 percent of the traffic movement at this intersection. However, the intersection does not accommodate this as the predominant movement. The commuters transitioning from northbound SR-146 to westbound SR-92 are required to stop at a stop sign, while commuters traveling from eastbound SR-92 to southbound SR-146 or commuters traveling north-south up and down the canyon do not have a stop sign. The predominant movement is also slowed by the roadway's geometry; commuters that transition between SR-146 and SR-92 in both directions have to travel along a sharp turn to make their route change, slowing them down. Conversely, commuters traveling up and down the canyon along SR-92 have a straight route. This existing geometry does not accommodate travel between SR-92 and SR-146 as the predominant movement. By taking traffic movement into consideration, an alternative that accommodates predominant traffic movement—like that at the SR-92 and SR-146 intersection—was developed.

Another factor that influenced the alternative development was side-street spacing. This spacing mainly influenced the vertical position of SR-92 in relation to cross streets. For the grade-separated alternatives discussed in detail below, available spacing—combined with terrain—determined if SR-92 would be placed above or below the cross streets. An example of this is the placement of SR-92 in relation to Triumph Boulevard and Traverse B. Because there is not enough space to change the roadway elevation without using an unacceptably steep grade, it was clear that SR-92 could not go under Triumph Boulevard and then over Traverse B; it was not feasible from an engineering standpoint. Therefore, the spacing of side streets limited the possible alternatives during development.

As mentioned above, consideration was also given to the level of impacts an alternative would have on the natural and built environment. This generally influenced the location of the horizontal alignment—for example, whether to widen to the north or south. During the development of alternatives, all known resources were considered and efforts were made to avoid them. Some of these resources include the following:

- Jordan Aqueduct and Provo Reservoir Canal
- Existing and Planned Accesses and Developments
- Homes and Businesses
- Major Power Corridor
- Sewer Lift Station near Dry Creek
- Cultural Resources (e.g., Historic Homes)
- American Fork River and Dry Creek
- Planned and Existing Multi-Use Trails
- Cedar Hills Golf Course

## 2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED

Several alternatives were considered during the development of the Preferred Alternative. As mentioned above, these alternatives were screened against the project's primary purpose and need objectives. If the alternative did not meet these objectives, it was eliminated. Secondary purpose and need, engineering feasibility, and environmental impacts shaped the alternatives but did not dictate their elimination. The following alternatives were considered but eliminated when it became apparent that they did not meet the project's primary purpose and need:

- Rapid Transit
- Off-Corridor Alignment
- Arterial with At-Grade Intersections
- Arterial with Grade-Separated Intersections

### **Rapid Transit**

This alternative would construct rapid transit improvements along SR-92 to accommodate some of the travel demand—thereby alleviating congestion. Bus service is a planned transit improvement for the future and has been included in all alternatives, including the No-Build Alternative; see Section 2.6 for further information. This alternative would not construct additional capacity for vehicles.

Providing transit alone would not be enough to meet the purpose and need. More than 50 percent of corridor users would need to switch to transit to accommodate the 2030 travel demand and to provide a LOS D or better at all intersections along the corridor. Unfortunately, existing transit usage indicates that this is unrealistic; current transit usage in either Utah County or Salt Lake County is less than five percent of total trips. In addition, the 2030 transit usage, which is based on forecasts using the MAG travel demand model, will be less than five percent in the study area. Therefore, it is unrealistic that this alternative could meet the purpose and need objective to achieve a LOS D or better at all intersections.

In addition to this alternative's inability to meet primary purpose and need, it has been previously evaluated and found to be inappropriate for the area. The Mountainland Association of Governments (MAG) is the designated metropolitan planning organization (MPO) for the project area. In their regional transportation plan (RTP), MAG evaluated rapid transit but did not propose this improvement for SR-92 because there is not enough land use density to justify it.

This alternative was eliminated because it does not meet the project's primary purpose and need; it would not provide a LOS D or better for all intersections through the year 2030. Because this alternative did not meet the primary purpose and need, a detailed evaluation of secondary purpose and need, engineering feasibility, and environmental impacts was not necessary.

### **Off-Corridor Alignment**

This alternative would redirect some of SR-92's traffic demand to a separate east-west facility that parallels SR-92. However, a specific location for this roadway was not identified because there is not an existing continuous east-west facility in the vicinity. SR-92 is the first east-west facility south of the point of the mountain, and the next continuous facility—Main Street in American Fork—is nearly four miles south. A continuous east-west roadway would need to be constructed by connecting discontinuous segments, which would result in excessive environmental impacts.

Steep terrain limits the ability to construct a northern corridor because it would require extensive cut and fill. A new corridor to the north would also dissect existing and planned neighborhoods and businesses. However, a new corridor to the south of SR-92 would pass through developed residential neighborhoods. Additionally, a new corridor could require the construction of a new interchange on I-15.

In addition to its environmental impacts, the alternative corridor would not meet the purpose and need objective to provide a LOS D or better for all intersections along SR-92. For all SR-92 intersections to operate at a LOS D or better in the year 2030, the alternative corridor would have to draw more than half of the traffic from SR-92. To evaluate if a separate corridor could potentially attract this percentage of users, a traffic analysis was performed using the MAG travel demand model. This model used an already planned, two-lane facility to predict the effect of a parallel corridor on SR-92's traffic demand; this planned roadway is a continuous, east-west facility that will be located two miles south of SR-92, along 9600 North. Through the evaluation using the travel demand model, it was determined that the presence of this parallel facility would only impact traffic volumes on SR-92 by five to ten percent. It is unlikely then that any new facility could attract fifty percent of the traffic from SR-92, making it unlikely that this alternative would meet the purpose and need objective to provide a LOS D or better for all of SR-92's intersections.

This alternative was eliminated because it did not meet the project's primary purpose and need; it would not provide a LOS D or better for intersections on SR-92 through the year 2030. Additionally, this alternative would have excessive environmental impacts. Because this alternative did not meet the primary purpose and need, a detailed evaluation of secondary purpose and need and engineering feasibility was not necessary.

### **Arterial with At-Grade Intersections**

This alternative would widen SR-92 from I-15 to SR-74 to three lanes in each direction and to two lanes in each direction from SR-74 to SR-146, with a median turn lane in some locations throughout the corridor. In this alternative, all intersections would be at-grade; the cross streets would be at the same level as SR-92, and major intersections would be signalized. New intersections would be constructed at locations where access agreements are already in place, and traffic signals would be added to intersections where side-street traffic volumes are high enough to warrant one. As shown on Figure 2-2, there would be a total of 17 intersections, with signals at 14 of those intersections.

Figure 2-2: Arterial with At-Grade Intersections



Despite adding dual left-turn pockets at numerous intersections to accommodate traffic from side streets turning onto and off of SR-92, one intersection, 1200 East, would still operate at an unacceptable LOS E under this alternative. Vehicles attempting to enter SR-92 from unsignalized intersections at IM Flash would experience delays ranging from 71 seconds to over two minutes. Under those conditions, vehicles would likely reroute to the signal at 1200 East, further exacerbating the delay at the 1200 East and SR-92 intersection. In addition to the operational analysis of the intersections, a travel time analysis was completed for the alternative. Travel time from SR-146 to the I-15 frontage road would increase from 13 to 14.5 minutes during the evening commute.

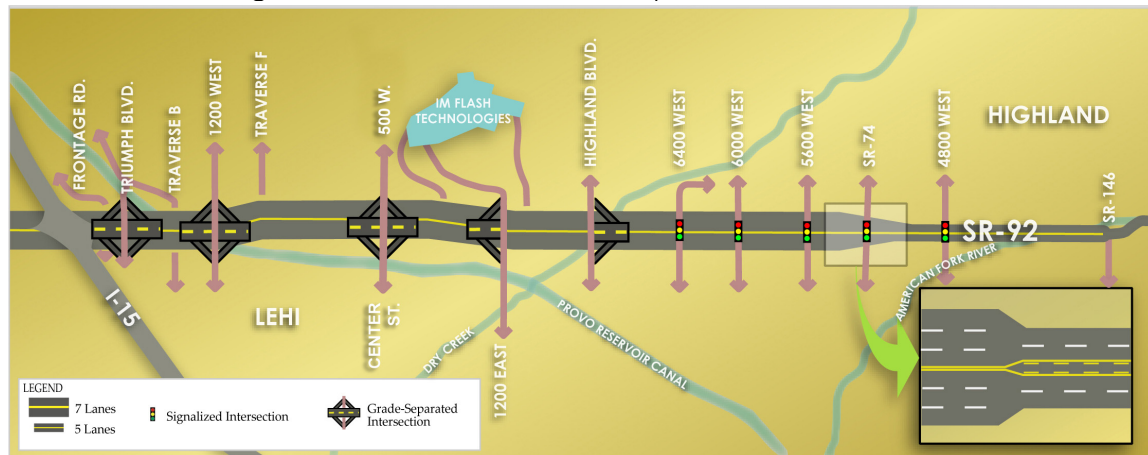
This alternative was eliminated because it did not meet the project's primary purpose and need; it would not provide a LOS D or better for the intersection of SR-92 and 1200 East in the year 2030 and would not improve existing travel time to and from I-15. Because this alternative did not meet the primary purpose and need, a detailed evaluation of secondary purpose and need, engineering feasibility, and environmental impacts was not necessary.

### **Arterial with Grade-Separated Intersections**

This alternative would widen SR-92 from I-15 to SR-74 to three lanes in each direction and to two lanes in each direction from SR-74 to SR-146, with a median turn lane in some locations throughout the corridor. As shown on Figure 2-3, this alternative includes grade-separated intersections at five locations: Triumph Boulevard, 1200 West, Center Street, 1200 East, and Highland Boulevard. A grade-separated intersection is an intersection where one street crosses over the other on a bridge so that through traffic on the main road is not required to stop. In this alternative, SR-92 would go over these five cross streets. Because the grade-separated intersections would be similar to interchanges on major freeways, ramps would be required to accommodate turning movements. Adequate spacing between grade-separated intersections is required so that ramps are not too steep and so that acceleration lanes can be developed. To provide adequate spacing, it would be necessary to eliminate some existing and planned accesses. There is not enough distance between 1200 East and Highland Boulevard to construct two complete grade-separated intersections with ramps in all four quadrants. Therefore, one full grade-separated intersection would be split between the two locations. Ramps toward the west would provide access at 1200 E, and ramps toward the east would provide access at Highland Boulevard.



Figure 2-3: Arterial with Grade-Separated Intersections



This alternative does not meet the project's primary purpose and need objective to provide a LOS D or better for all of SR-92's intersections. Under this alternative, six intersections would operate at a LOS E or F. The intersection with the highest overall delay would be at 6400 West, due to eastbound traffic. This delay would result in queues backing onto the grade-separated portion of SR-92.

In addition to this alternative's inability to meet primary purpose and need, this alternative does not accommodate existing or planned access points. There is not enough spacing between existing and planned access points to create all necessary grade-separated intersections; some existing and planned accesses would need to be eliminated. It would require the elimination of one existing access at IM Flash and would not accommodate two accesses to Traverse Mountain, which are currently being constructed.

This alternative was eliminated because it did not meet the project's primary purpose and need; it would not provide a LOS D or better for six intersections in the year 2030. This alternative would also not accommodate existing and planned access points. Because this alternative did not meet primary purpose and need, a detailed evaluation of its engineering feasibility and environmental impacts was not necessary.

## 2.6 ALTERNATIVES CARRIED FORWARD FOR DETAILED EVALUATION

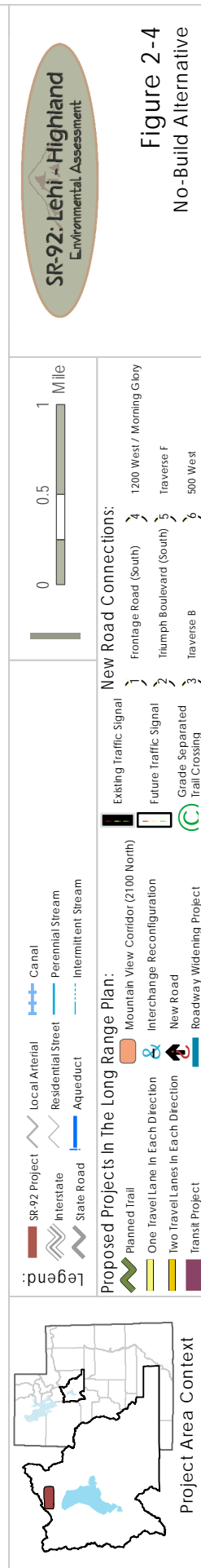
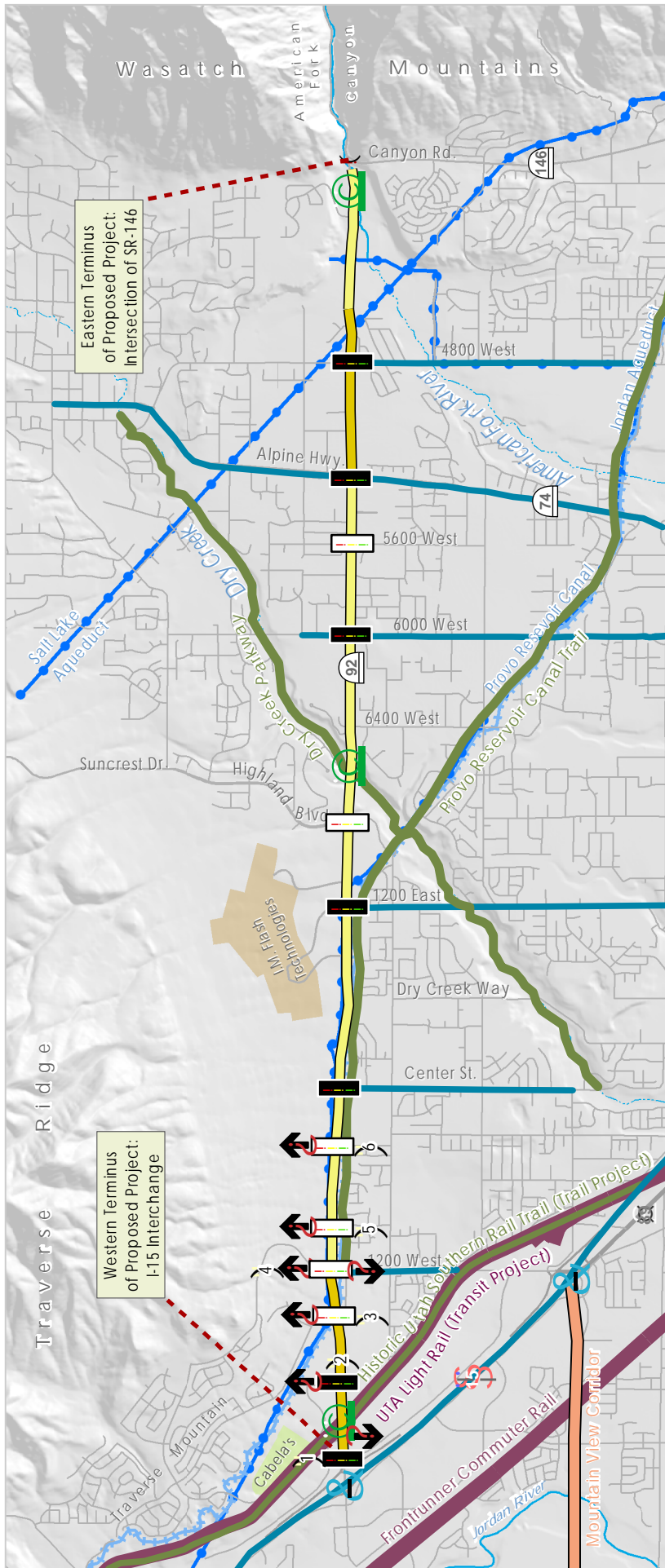
### No-Build Alternative

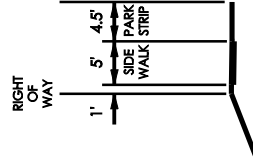
This alternative assumes 2030 conditions in the absence of the proposed action and provides a baseline for comparison to the proposed action. The No-Build Alternative generally includes all other projects that are funded for improvement in the project area, excluding the proposed action. Under the No-Build Alternative, the following projects would be constructed:

- Widening of I-15 to four travel lanes and one high-occupancy vehicle lane in each direction from Draper to Payson
- Reconfiguration of the I-15 interchange at SR-92
- Construction of a new interchange on I-15 in north Lehi between SR-92 and the point of the mountain
- Construction of Mountain View Corridor (2100 North Freeway Alternative assumed)
- Construction of commuter rail along the I-15 corridor from Provo to Salt Lake

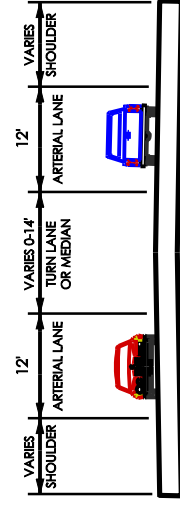
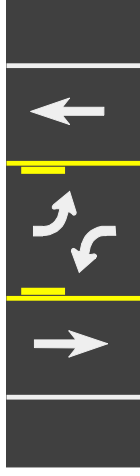
- Construction of light rail from Lehi to Salt Lake along the UTA corridor crossing SR-92
- Widening of Center Street, 1200 East, 6400 West, 6000 West, 5600 West, SR-74, and 4800 West
- Extension of 1200 West, connecting Bull River Road to SR-92
- Construction of Historic Utah Southern Rail Trail along the UTA corridor
- Enclosure of Provo Reservoir Canal, which is also known as the Murdock Canal
- Construction of Provo Reservoir Canal Trail
- Implementation of bus service along SR-92

The No-Build Alternative is intended to show traffic conditions in 2030 if no major improvements are made to SR-92. The roadway would still have the same number of lanes that exist today—generally two lanes in each direction between I-15 and approximately 1200 West in Lehi and one lane in each direction between 1200 West and SR-74. As it is now, SR-92 transitions back to two lanes in each direction east of SR-74 until just west of SR-146. Under the No-Build Alternative, it is assumed that new intersections would be constructed at locations where access agreements are already in place. The No-Build Alternative also assumes that traffic signals would be added to intersections where side-street traffic volumes would be high enough to warrant one. There would be a total of 17 intersections, with signals at 13 of those intersections. For traffic analysis, it was assumed that the signal timing was coordinated along the corridor. Figure 2-4 shows the other projects that would be constructed in the area under the No-Build Alternative. Figure 2-5 shows the lane configuration. Figure 1-6 shows the assumed intersection layout, LOS, and travel time for evening peak-hour conditions.

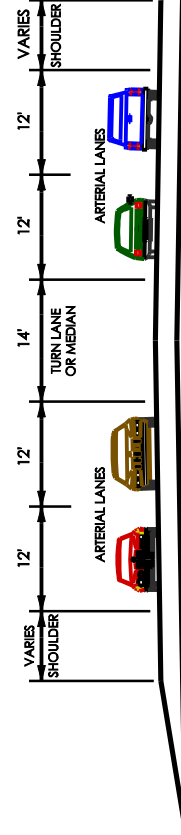
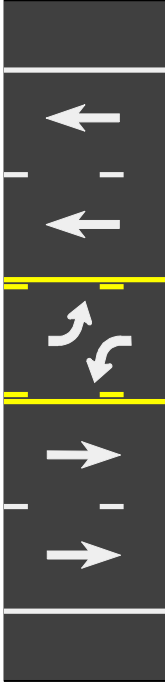




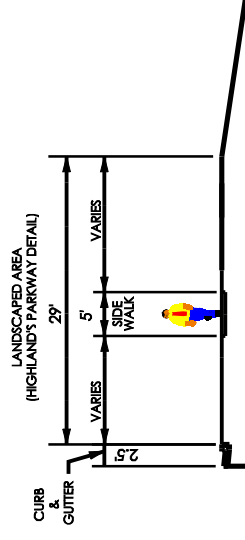
**Park Strip and Sidewalk**  
Generally Between 6000 West and 4800 West on Both Sides Where Landscaped Parkway Area Is Not Present



**One Travel Lane in Each Direction**  
From 1200 West to SR-74 and from East of 4800 West to SR-146



**Two Travel Lanes in Each Direction**  
From I-15 to 1200 West and from SR-74 to East of 4800 West



**Landscaped Parkway Area**  
(Highland's Parkway Detail)  
6400 West to 6000 West, South Side, and at Other Discontinuous Locations in Highland



**Figure 2-5**  
No-Build Alternative  
Typical Section

The No-Build Alternative also incorporates transportation system management/travel demand management (TSM/TDM) strategies. TSM/TDM strategies are used to maximize the use of available capacity on highway facilities without adding additional lanes. They are generally used as a lower cost alternative to roadway widening projects. TSM focuses on improving existing facilities with measures like signal retiming, signal coordination, adaptive signal control, and turn-pocket additions at intersections. The No-Build Alternative assumes the implementation of TSM measures by optimizing the signal timing and coordination for the SR-92 intersections.

TDM focuses on limiting the number of vehicles on the roadway by encouraging things like carpooling, transit and bicycle usage, and telecommuting. The capacity of a three-lane arterial—for example, the section of SR-92 in east Lehi—is about 17,000 vehicles per day. The future traffic demand for SR-92 under the No-Build Alternative in east Lehi is between 30,000 and 35,000 vehicles per day. Even the most successful TDM strategies would not be able to decrease traffic volumes by half. Future planned bus service will alleviate some congestion and was included in the background assumptions for all other alternatives considered.

Under the No-Build Alternative, capacity would not increase. However, the traffic demand would increase by 50 percent on the east end and by 100 percent near I-15. Operations on 90 percent of the corridor and at 15 of 17 intersections are expected to breakdown to an unacceptable LOS E or F. Travel time from the I-15 frontage road to SR-146 would increase from 19 to 47 minutes during the evening commute. Because capacity is restricted, traffic would divert from SR-92 to the surrounding roadway system, accessing I-15 from the interchanges at 1200 West, Main Street, and north Lehi. The No-Build Alternative does not meet the purpose and need objectives to provide a LOS D or better at intersections along the corridor through the year 2030 or to improve existing travel time. Implementing TSM/TDM strategies alone is not sufficient to meet the purpose and need objectives. However, some of the TSM strategies are included in other alternatives that were considered. Although the No-Build Alternative would not provide a LOS D or better for 15 out of 17 intersections in the year 2030 and would not improve existing travel time to and from I-15, it is carried forward for evaluation to serve as a baseline comparison for the proposed action and to comply with NEPA regulations. A detailed evaluation of environmental impacts is discussed in Chapter 3.

### **Arterial with Express Lanes (Preferred Alternative)**

#### **Lane and Intersection Configuration**

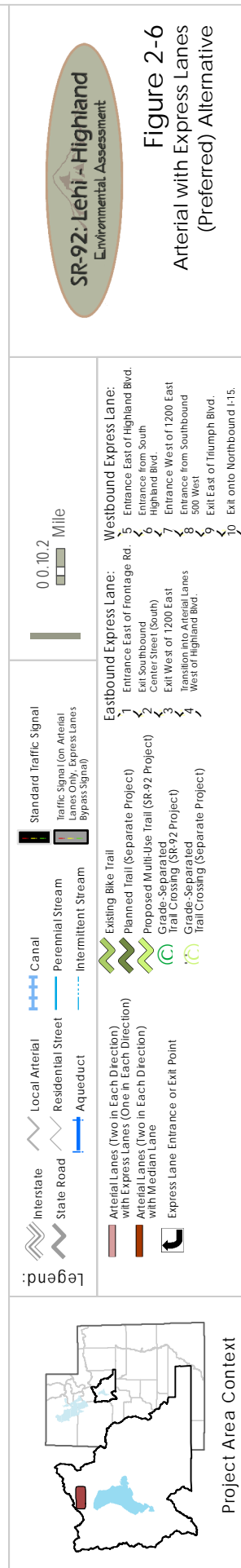
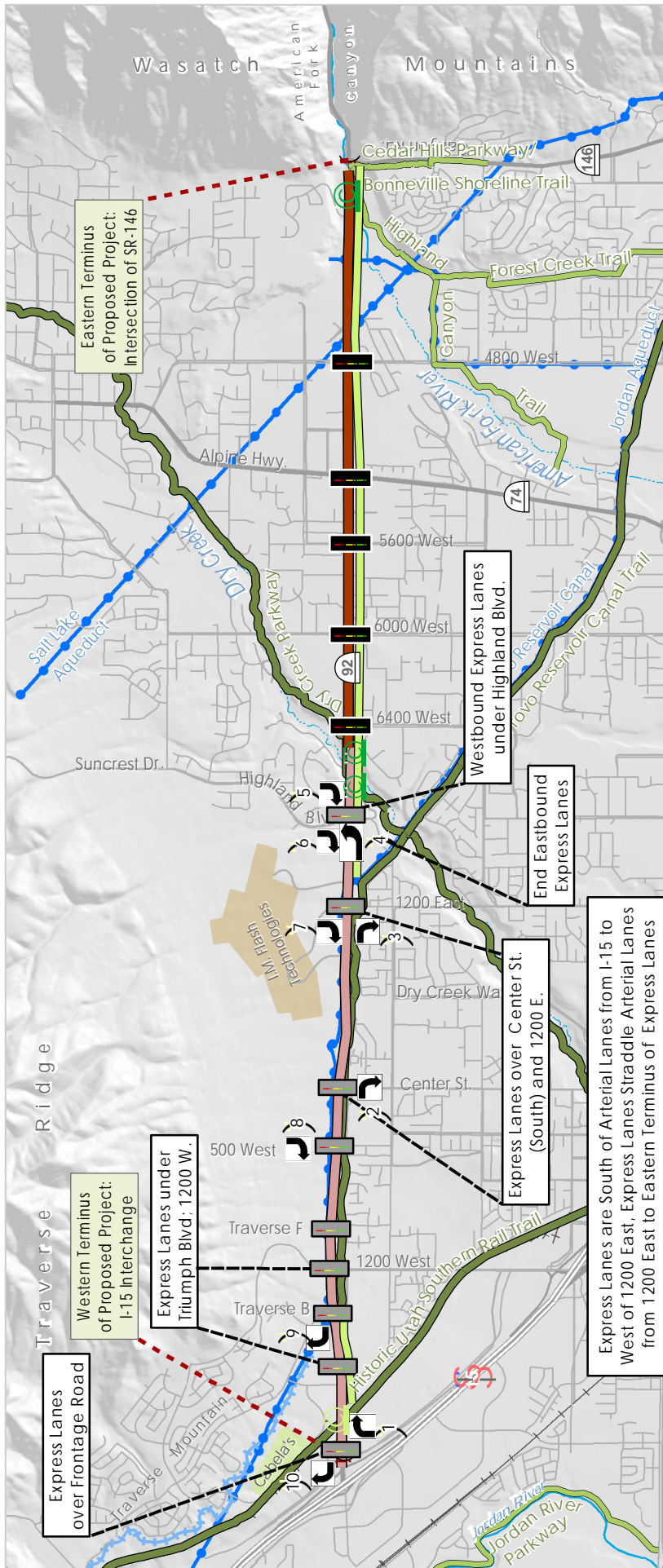
This alternative would widen SR-92 to include two standard arterial lanes in each direction along the entire corridor and one grade-separated express lane in each direction from I-15 to Dry Creek. There would be some sections with three arterial lanes in each direction—in both directions between I-15 and Triumph Boulevard and eastbound between 1200 East and 6000 West. East of Dry Creek, this alternative is the same as the arterial alternative with at-grade intersections. Figure 2-6 shows the lane configuration, and Figure 2-7 shows typical cross sections. The express lanes would go over or under cross streets so that vehicles using the express lanes would not have to stop. The arterial lanes would be at the same level as the cross streets; this would allow vehicles using the arterial lanes to turn onto and off of SR-92. The express lanes would be south of the arterial lanes between I-15 and Center Street. East of Center Street, the express lanes would split and the arterial lanes would be in the center. Figure 2-8 shows this alternative's intersection

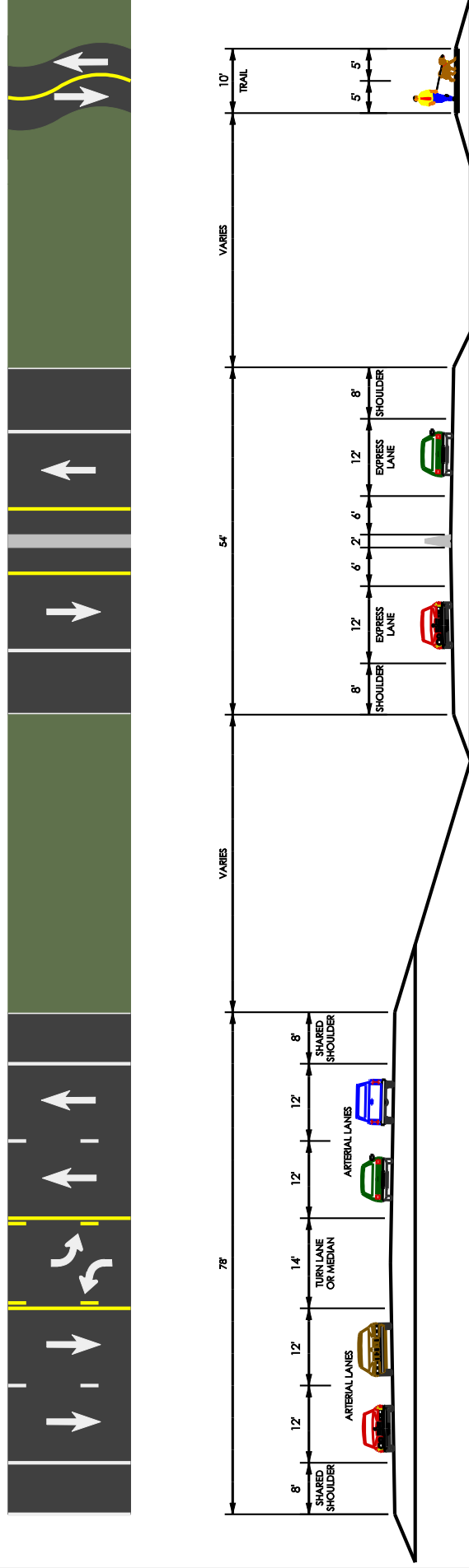
layout, LOS, and travel time during the evening peak-hour conditions. Access to and from the express lanes would be limited to the following locations:

- Entrance to westbound express lane east of Highland Boulevard and west of 1200 East
- Entrance to westbound express lane from southbound Highland Boulevard and southbound 500 West
- Exit from westbound express lane east of Triumph Boulevard and onto northbound I-15
- Entrance to eastbound express lane east of I-15 frontage road
- Exit from eastbound express lane to southbound Center Street South, west of 1200 East, or transition into arterial lanes east of 1200 East

Under this alternative, the intersection of SR-92 and SR-146 would be reconfigured to accommodate the predominant traffic movement between the west leg of SR-92 and SR-146. This movement would become the through movement; vehicles would not be required to stop. Traffic going up or coming down the canyon would be required to stop at a stop sign.



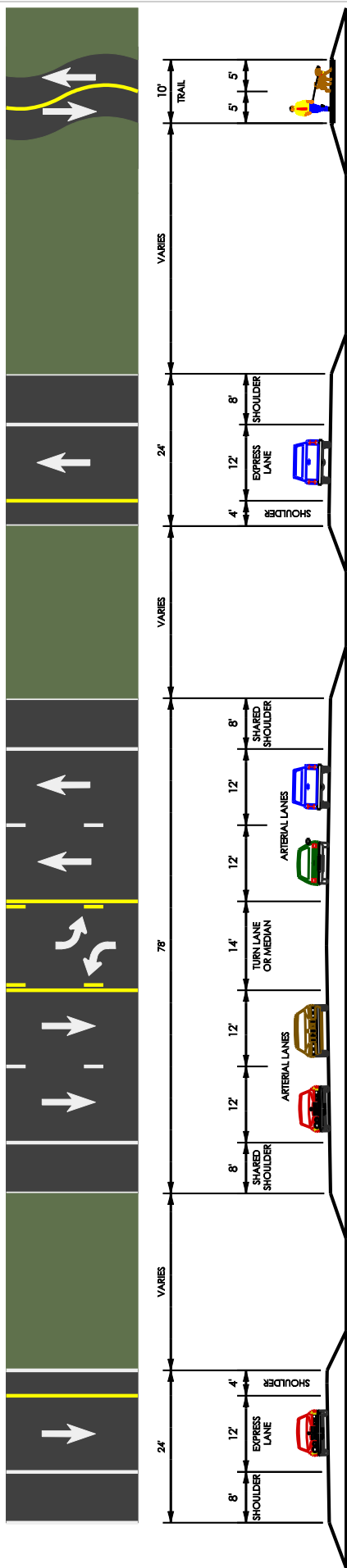




**Arterial Lanes (Two in Each Direction) with Express Lanes (One in Each Direction)**  
From I-15 to Dry Creek

Express Lanes South of Arterial Lanes from I-15 to 1200 E.



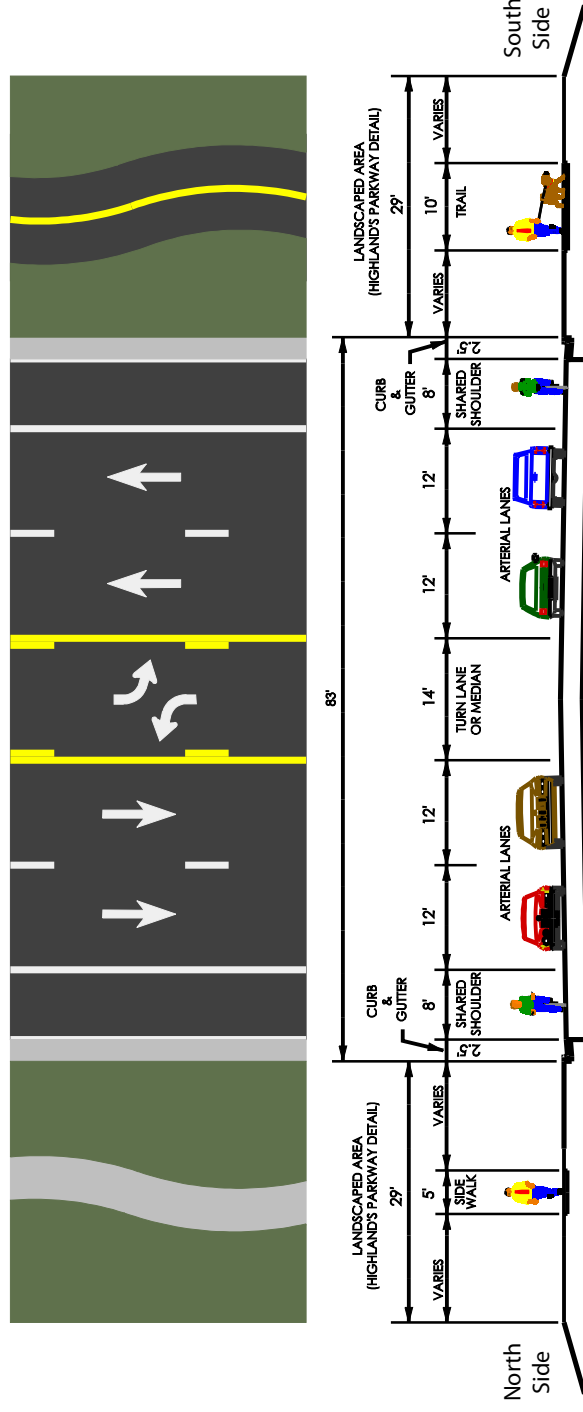


**Arterial Lanes (Two in Each Direction) with Express Lanes (One in Each Direction)**  
From I-15 to Dry Creek

Express Lanes Split - Arterial Lanes in the Center from 1200 E. to Dry Creek



**Figure 2-7, page 2 of 4**  
Arterial with Express Lanes  
(Preferred) Alternative  
Typical Section



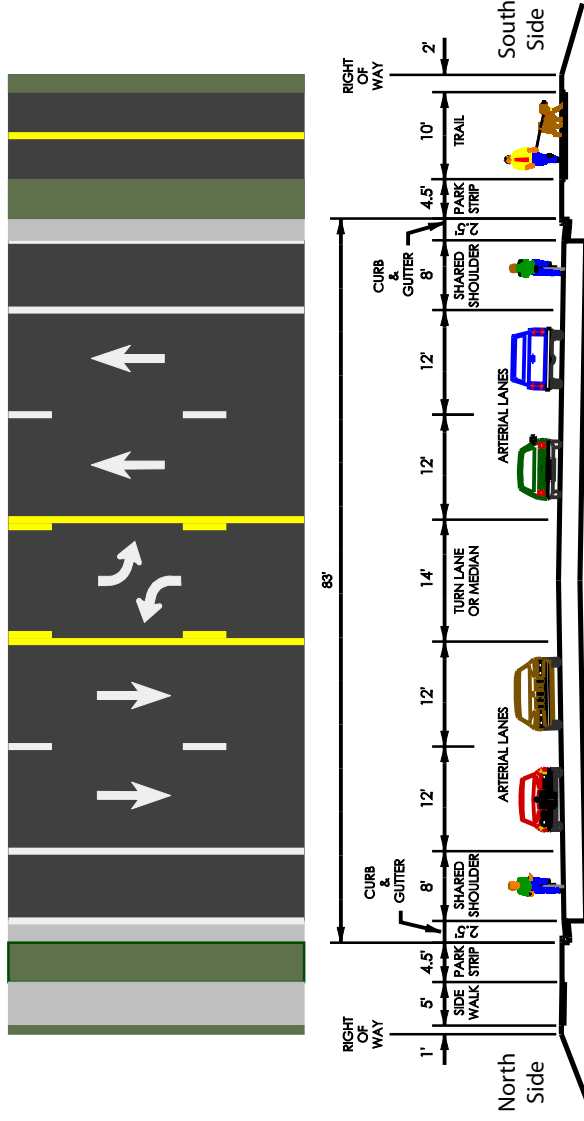
### Arterial Lanes (Two in Each Direction) with Median Turn Lane

From Dry Creek to SR-146

with Landscaped Parkway Area (Highland's Parkway Detail) from 6400 West to SR-74

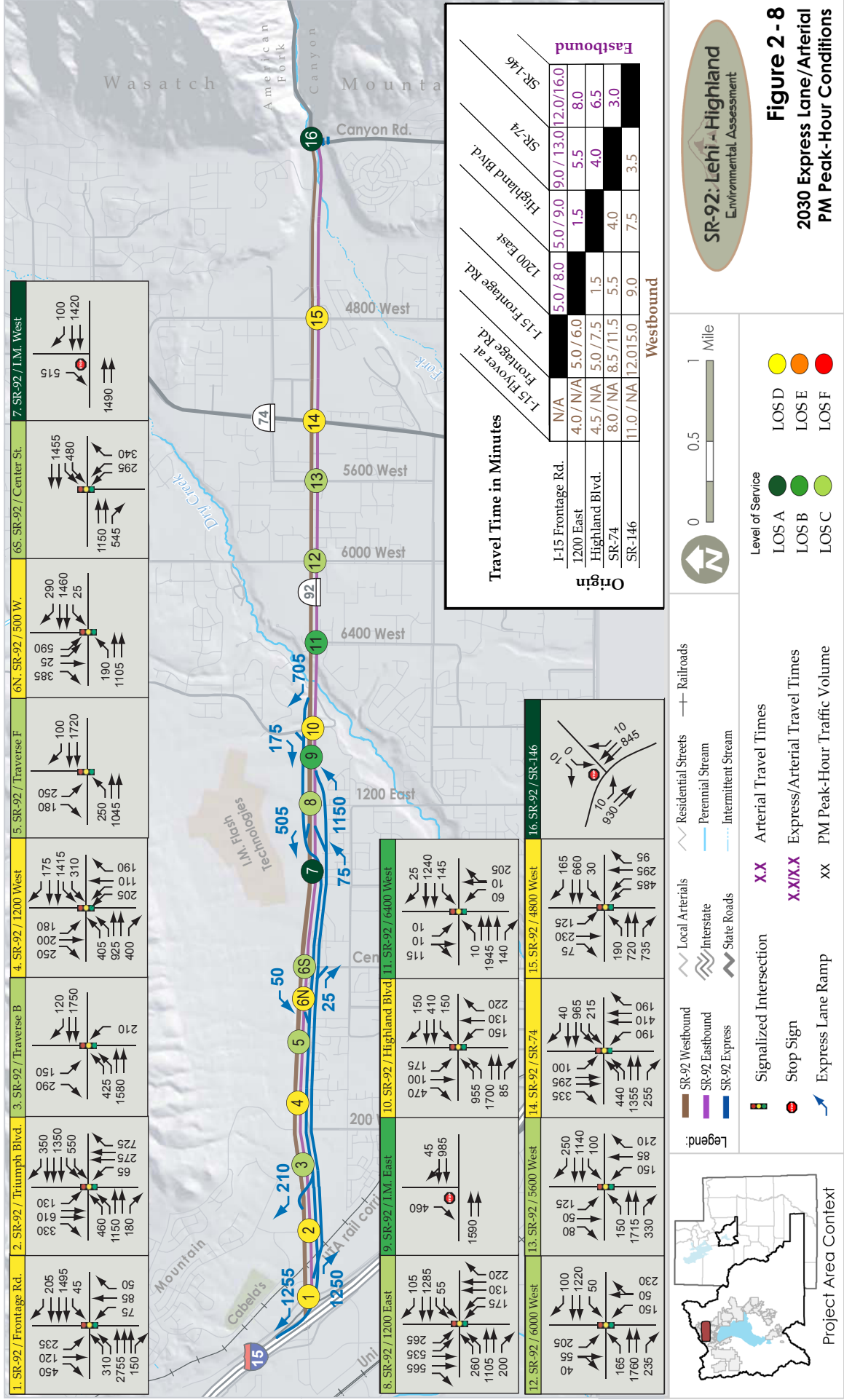


**Figure 2-7, page 3 of 4**  
 Arterial with Express Lanes  
 (Preferred) Alternative  
 Typical Section



**Arterial Lanes (Two in Each Direction) with Median Turn Lane**  
From Dry Creek to SR-146

with Sidewalk on North Side and Trail on South Side, SR-74 to SR-146



**Bicycle and Pedestrian Accommodations**

This alternative would construct a ten-foot wide paved multi-use trail on the south side of SR-92, except where the Provo Reservoir Canal Trail is already planned. Combined with the Provo Reservoir Canal Trail project, this alternative would provide a continuous multi-use trail on the south side of SR-92 from I-15 to the mouth of the American Fork Canyon. It would also provide crossings at Maple Hollow and Dry Creek so that the Highland Boulevard Trail and Dry Creek Parkway, when constructed in the future, would be accommodated. In addition, this alternative would provide an underpass near the Bonneville Shoreline Trail at the intersection of SR-92 and SR-146. These trail improvements are shown on Figure 2-6.

As shown on Figure 2-7, this alternative would also provide an eight-foot wide shoulder on the arterial lanes. This shared shoulder would provide a break down area for vehicles and would also accommodate road cyclists between I-15 and the mouth of the canyon. In addition, this alternative would provide pedestrian crossings at all signalized intersections except the I-15 frontage road and Traverse B. These two intersections would facilitate east-west pedestrian traffic but not north-south pedestrian traffic. Pedestrians desiring to travel north-south at these intersections would have to cross at Triumph Boulevard, 1200 West, or at the future Historic Utah Southern Rail Trail. This alternative would also provide a continuous sidewalk on the north side of SR-92 from 6400 West to SR-146. Between 6400 West and SR-74, this sidewalk would be included in a 29-foot wide landscaped area, as shown in Figure 2-7; this landscaped area is also known as Highland's Parkway Detail. Another 29-foot landscaped parkway with a ten-foot wide multi-use trail would also be provided on the south side of SR-92 in this area.

**Access**

This alternative was developed to provide a balance between access and mobility. Many commuters from Highland, Alpine, and Cedar Hills use SR-92 as a direct route to I-15, while motorists in Lehi use SR-92 for access to businesses. Unfortunately, the motorists using SR-92 for access to businesses can slow down the commuters using SR-92 as a direct route to I-15. However, this alternative would accommodate both. The express lanes would provide improved mobility for commuters who desire to travel directly to or from I-15, which is anticipated to be up to half of SR-92's traffic.

The Preferred Alternative was designed to provide limited access to SR-92 from I-15 to 6000 West now and, in the future, to provide restricting access to the locations outlined below:

- Frontage Road
- Triumph Blvd
- Traverse B
- 1200 West
- Traverse F (North Only)
- 500 West (North Only)
- Center Street (South Only)
- IM West (North Only)
- 1200 East
- IM East (North Only, Right-In/Right-Out)
- Lehi Pointe (Two Locations: South Only, Right-In/Right-Out)
- Highland Boulevard
- Tamarack Drive

- 6400 West
- 6200 West
- 6000 West

The intersections are consistent with UDOT's access management standards for SR-92 in Lehi and Highland and ensure that "These facilities provide ... interstate, inter-regional, intra-regional, and intercity travel needs in urban areas. Direct access service to abutting land is subordinate to providing service to through traffic movements" (UDOT 2006). Detailed traffic scenarios were analyzed for current and the future 2030 year, and the intersections outlined above provide the optimal mix of traffic operations to ensure that the through traffic mobility is met.

The arterial lanes would provide access to businesses and homes along the corridor. It is important to note that some existing access points would need to be altered. Also, some cross streets would need to be realigned to tie into SR-92 at different locations to improve the spacing between access points. All major existing and planned access points would be accommodated under this alternative.

Under the Preferred Alternative, Bull River Road and Gambol Oaks Drive would end in cul-de-sacs, eliminating the opportunity to access SR-92 directly. However, the Preferred Alternative would include a new intersection at 1200 West and SR-92, allowing residents south of the corridor to access SR-92. Residents of Bull River Road would access SR-92 from 1200 West. The new access for Gambol Oaks Drive would be at 6400 West.

The Preferred Alternative would consolidate access points for IM Flash Technologies. The proposed 500 West entrance would allow employees to access the westbound express lane. Two existing western entrances would be consolidated into one entrance, which would improve spacing between entrances. The new entrance would be designed to accommodate the capacity of both the relocated entrances. The 1200 East entrance would remain.

Under the Preferred Alternative, raised medians would restrict left turns in and out of some commercial and residential areas. West of Highland Boulevard, the eastbound express lanes merge onto the arterial lanes. Raised medians would be constructed at this location to prevent left turns onto SR-92 that conflict with decelerating express lane traffic. This would require both planned Smith's Marketplace entrances fronting SR-92 to be right-in and right-out facilities only. Full access would be available to the development from Highland Boulevard. Commercial areas at the intersection of SR-92 and SR-74 would also be limited to right-in and right-out access. Full access into these areas would be available on SR-74. Medians would also restrict the use of left turns in and out of 5900 North. Westbound travel would be accessed by way of 5870 West.

### **Purpose and Need Objectives**

This alternative meets the primary purpose and need objective to provide a LOS D or better for all intersections along the corridor through the year 2030. This alternative also meets the primary purpose and need objective to improve 2030 travel time to and from I-15; it currently takes vehicles 19 minutes to travel eastbound from I-15 to SR-146 and 13 minutes to travel westbound from SR-146 to I-15 during the evening peak-hour traffic (Fehr & Peers 2007b). Compared to existing travel times, both westbound and eastbound 2030 travel times for vehicles using the express lanes in this alternative would decrease. Westbound 2030 travel time would decrease from 13 to 12 minutes, and eastbound travel time would decrease from 19 to 12 minutes (Fehr &

Peers 2007b). This represents an 8 to 36 percent savings in time compared to the existing condition. Travel between I-15 and SR-146 on the arterial lanes would take 15 minutes westbound and 16 minutes eastbound.

This alternative began as an arterial with express lanes from Center Street to Dry Creek and was presented at the public meeting held in September of 2007. There was substantial support from the public and stakeholders to also improve travel time by taking the express lanes all the way to I-15. Taking the express lanes all the way to I-15 improves travel time throughout the corridor while balancing the impacts to the surrounding environment; the impacts of the shorter and longer express lanes are the same. FHWA and UDOT incorporated the comments, and the resulting alternative is an arterial with eastbound express lanes from I-15 to east of 1200 East and westbound express lanes from west of Highland Boulevard to I-15.

As discussed in Section 2.4, the secondary purpose and need objectives were taken into consideration during the development of this alternative. These needs include accommodating bicycles and pedestrians, balancing access with improved traffic flow, and providing improvements that are an asset to the community. This alternative meets all of the secondary purpose and need objectives by performing the following:

- Accommodating bicycles by providing continuous shoulders with an appropriate width, based on UDOT standards and AASHTO guidance.
- Providing pedestrian access across SR-92 at signalized intersections and along SR-92 at appropriate locations.
- Providing connectivity for the multi-use trail system between the planned Historic Utah Southern Rail Trail and Provo Reservoir Canal Trail and the existing trails at the mouth of the American Fork Canyon.
- Accommodating grade-separated crossings at planned locations, including the Historic Utah Southern Rail Trail, the Highland Boulevard Trail, the Dry Creek Parkway, and the Bonneville Shoreline Trail.
- Consolidating or relocating accesses to improve spacing where possible.
- Controlling left turns with signals at appropriate locations.
- Accommodating existing and planned access points.
- Accommodating Highland's landscaped parkway detail.
- Accommodating development site layout plans that have already been approved.
- Preserving trees where possible.

This alternative was carried forward because it would meet the project's primary purpose and need; it would provide a LOS D or better for all intersections in the year 2030 and would improve existing travel time to and from I-15. A detailed evaluation of environmental impacts is discussed in Chapter 3.

## 2.7 SUMMARY OF ALTERNATIVES CONSIDERED

Table 2-1: Summary of Alternatives Considered

	No-Build Alternative	Transit	Off-Corridor Alignment	Arterial with At-Grade Intersections	Arterial with Grade-Separated Intersections	Preferred Alternative
<b>Primary Purpose &amp; Need Objective: All Intersections Operate at LOS D or Better in 2030</b>	Fifteen intersections operate below LOS D.	Qualitatively determined LOS D not achievable.	Qualitatively determined LOS D not achievable.	One intersection operates below LOS D.**	Six intersections operate below LOS D.	All intersections operate at or above LOS D.
<b>Primary Purpose &amp; Need Objective: Improve Existing Travel Time* and Provide the Best Overall Corridor Travel Time</b>	Westbound travel time increases from 13 to 54 minutes. Eastbound travel time increases from 19 to 48 minutes.	Detailed traffic analysis not performed because of inability to meet LOS D objective.	Detailed traffic analysis not performed because of inability to meet LOS D objective.	Westbound travel time increases from 13 to 14.5 minutes. Eastbound travel time decreases from 19 to 14.5 minutes.	Detailed traffic analysis not performed because of inability to meet LOS D objective.	Westbound travel time decreases from 13 to 12 minutes. Eastbound travel time decreases from 19 to 12 minutes.
<b>Secondary Purpose &amp; Need and Engineering &amp; Environmental Considerations</b>	N/A	N/A	Has excessive environmental impacts.	N/A	Does not meet secondary purpose and need to accommodate existing and planned accesses.	Meets all secondary purpose and need objectives.
<b>Determination</b>	Carried forward for detailed evaluation but does not meet primary purpose and need objectives to provide a LOS D and to improve travel time.	Eliminated because it does not meet primary purpose and need objective to provide a LOS D.	Eliminated because it does not meet primary purpose and need objective to provide a LOS D.	Eliminated because it does not meet primary purpose and need objectives to provide a LOS D and to improve travel time.	Eliminated because it does not meet primary purpose and need objective to provide a LOS D.	Carried forward for detailed evaluation because it meets primary purpose and need objectives to provide a LOS D and to improve travel time.
* Existing evening peak-hour corridor travel time from SR-146 to I-15 is 13 minutes westbound and 19 minutes eastbound.						
**Under the Arterial with At-Grade Intersections Alternative, 1200 East would operate at LOS E or worse. See discussion on page 2-8.						

The No-Build Alternative does not meet the purpose and need objectives for this project but has been retained for comparative purposes. Because an arterial with express lanes from I-15 to Dry Creek is the alternative that best meets the purpose and need, it has been identified by UDOT as the Preferred Alternative.